BERKELEY LAB

SCIENCE ON THE HILL

The Community Newsletter of Lawrence Berkeley National Laboratory Winter 2001

Community Outreach

did you ever wonder..?

Berkeley Lab has launched a new information program entitled "Did You Ever Wonder?" that is designed to inspire, inform, educate—even recruit—our neighbors in the city of Berkeley and other East Bay communities, as well as students, faculty, and staff on the UC campus.

The most visible features of "Did You Ever Wonder?" are the posters on the sides of the Lab's offsite shuttle buses. The posters depict individual Lab researchers and a scientific question about their work, along with an invitation to find the answers by visiting the Lab's "Wonder" website (www.lbl.gov/wonder/). Featured researchers come from a wide variety of backgrounds and are studying human health, the environment, and new technologies, as well as seeking answers to the most fundamental questions about nature and the universe in which we live.

Each month three new profiles are being added to the Wonder website, for a total of 12 in all. The web profiles, aimed at an interested general audience, have also been printed as colorful single-sheet "broadsides" for distribution to schools and public locations. The broadsides contain the same text and images and list many of the same web sites as the web profiles. Interested teachers and others are invited to request copies by emailing didyoueverwonder@lbl.gov.

HEALTH NEWS

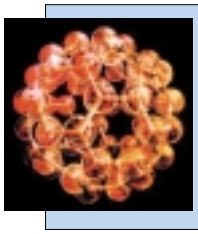
Lab Focuses on Breast Cancer Research

The National Cancer Institute estimates that nearly 13 percent of all women in the U.S. will develop breast cancer, the most common malignancy among women and, for those between the ages of 40 and 45, the most lethal. Each year more than 180,000 American women develop the disease, and each year nearly 50,000 die from it.

Important progress is being made in the effort to better understand, diagnose and treat breast cancer here at Berkeley Lab. The breast cancer research efforts entails more than 20 individual projects amounting to more than $16 million. This investment represents a wide diversity of disciplines, from instrumentation development for the early detection of breast tumors, to the study of the basic mechanisms of normal behavior of breast tissue and what triggers the progression toward malignancy, to examining such influences on breast cancer development and prevention as cellular aging, DNA repair, hormones, growth factors and many others.

"Cancer is the result not just of genetic change, not just of loss of growth regulation, or of environmental factors or aging, but an interweaving of all of these factors," says Life Sciences Division Director Mina Bissell, which is why scientists from many disciplines at the Lab are researching the origins and treatment of breast cancer.

For more information on the specific breast cancer research projects currently being conducted at the Lab, go to www.lbl.gov/lifesciences/BCancer/BCabstracts.html



As one of our many educational websites, MicroWorlds (www.lbl.gov/MicroWorlds/) provides an interactive tour of current research in the materials sciences at Berkeley Lab's Advanced Light Source (ALS). Along the way, visitors will find out many interesting facts, such as how a beamline can propel electrons to nearly the speed of light and why polymers are so useful. For teachers, there are three classroom teaching modules on materials science.

Science Education

Scientist Peggy McMahan and student working together on a physics experiment as part of the several summer education programs at the Lab.

Students on the Hill

This summer, 25 high school students, including seven from Berkeley High, worked as paid interns at the Lab as part of the new High School Student Research Participation Program. Paired up with some of the Lab's 1,300 scientists and engineers, the students learned first hand the tiny steps one takes when attempting to unravel the secrets of the universe. Depending on their job, they were exposed to cutting-edge work in the areas of physics, life sciences, earth sciences, engineering and environmental science.

For Kelsey Israel-Trummel, who will be a Berkeley High junior in the fall, working at the Lab has helped her appreciate how much work, dedication and knowledge it takes to bring a scientific experiment to a successful conclusion.

"In school you just learn about chemistry, biology and all the different subjects separately," she said. "But here I'm noticing how all the different stuff fits together."

To learn more about our education outreach programs, visit the Center for Science and Education website www.csee.lbl.gov.

Local Resident

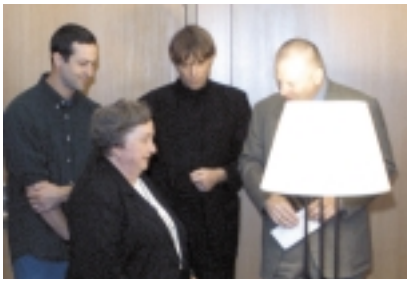
Saving Energy in Berkeley

The energy-efficient Berkeley Lamp—developed by Lab scientists—is now saving the City of Berkeley money. Thirteen Berkeley Lamps and a pair of compact fluorescent torchieres (also developed by the Berkeley Lab group) were donated to the city for installation into the city's Engineering Office, replacing the overhead lighting.

"It is enormously gratifying that the Berkeley Lab, a great public resource, is working with the city to help to reduce its energy bill," said Mayor Shirley Dean.

The Berkeley Lamp combines energy efficiency with high quality lighting, using two fully dimmable compact fluorescent lights to provide room illumination through both uplight and downlight illumination.

According to the city, the lamps will reduce peak demand by 50 percent and kilowatt-hour consumption by nearly 60 percent. Furthermore, peak power use will be cut in half and carbon emissions will be reduced from six tons of carbon dioxide per year to 2.5 tons.



The Lab officially presents donated Berkeley Lamps to Mayor Shirley Dean.

Early next year the city will make these lamps available to Berkeley residents at the Berkeley Farmer's Market through its energy-efficient purchasing program.

For more on lighting innovations at the Lab, go to www.eetd.lbl.gov/btp/lsr.

Global Citizen

Center for the Study of Aging Is Launched

In order to capitalize on the long history of aging research and education in the Bay Area, researchers with Berkeley Lab and the University of California at Berkeley have launched the Center for Research and Education on Aging (CREA).

Judy Campisi, a cell biologist in Berkeley Lab's Life Sciences Division and a leading authority on aging research, along with Paola Timiras, a UC Berkeley professor emeritus and pioneer in the study of hormonal effects on aging, organized CREA. Now the two women serve as CREA's co-directors.

The mission of CREA is to generate funding that will support high-risk pilot or long-term research projects in the Bay Area, and to educate the scientific community as well as the general public about issues in aging research. The first CREA-sponsored symposium, "The New Science of Aging," was held this October.

By helping to integrate the biology talent in the Bay Area and providing speedier and more flexible funding opportunities, Campisi and Timiras hope to answer age-old questions about prolonging youthful health and vigor sooner rather than later.

For more information on CREA, its programs and its funding opportunities, check the website at www.crea.berkeley.edu.

Records are made to be broken. After just achieving 14.7 tesla, the Superconducting Magnet Group is already planning the design of a magnet that should reach 15 tesla.

World-Record Magnet 300,000 Times the Strength of the Earth's Magnetic Field

Is there a more rewarding thrill than to break a record? Whereas most of us must content ourselves with breaking personal bests, this summer the scientists and engineers of Berkeley Lab's Superconducting Magnet Group experienced the rush of shattering a world record. Dubbed RD-3, the team's newest niobium-tin dipole electromagnet reached an unprecedented field strength of 14.7 tesla, a measure of magnetic flux density.

Dipole magnets are used by accelerators to bend and maintain the path of particle beams. The higher the field strengths of the magnets, the tighter the arc of the beam, and with stronger dipole magnets, an accelerator can push particles to much higher relativistic energies around the same-sized circular beam path.

The new world-record-holding magnet is one meter long, weighs several tons, and consists of three magnetic coil modules made from more than eight miles of niobium-tin wire. The previous record field strength for a dipole electromagnet was 13.5 tesla. It was set in 1997 also by a niobium-tin electromagnet designed and built here at Berkeley Lab.

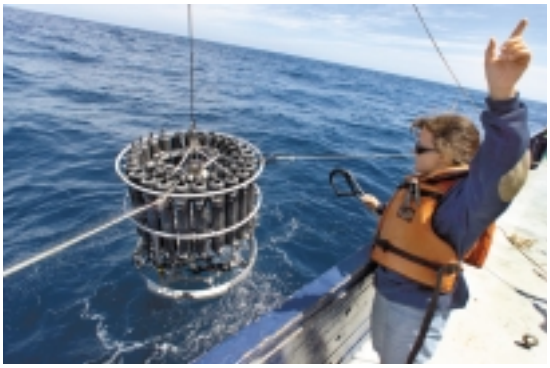
For more on the world-record magnet, visit www.lbl.gov/Science-Articles/Archive/14-tesla-magnet.html

Joint Genome Institute Leads fugu Breakthrough

Is it sushi or is it science? Researchers from the Lab's Joint Genome Institute (JGI) have completed a draft sequence of the *Fugu rubripes*, also known as the deadly pufferfish. The fugu draft represents the first vertebrate sequence made available since the momentous Human Genome Project. The fugu genome is posted freely on the web, confirming that there is enough science in the fish to sustain a community of researchers engaged in comparative genomics. The fugu carries essentially the same genes and regulatory sequences as humans—albeit with just 365 million DNA bases compared to the 3 billion that make up the human genome. Researchers hope that by studying the fugu's so-called "junk DNA," or the DNA that has no obvious function, they can also identify the same in human DNA, thereby identifying more regulatory DNA sequences in the process. For more information about the fugu, visit the JGI's fugu Fun Facts site: www.jgi.doe.gov/fugu.

"We took up the challenge to reassemble the genome by putting together nearly four million overlapping fragments — in the same way that you'd put together a giant jigsaw puzzle," said Dan Rokhsar, JGI's associate director for computational genomics.

Searching for Ways to Store Carbon



The crew of the *New Horizon* tests ways to develop "a forensic science to detect biological activity in the deep sea," said Lab scientist Jim Bishop.

To prevent more greenhouse gases from entering the atmosphere, Lab scientists are looking at alternative ways to store carbon. One place to sequester carbon is in the oceans, which currently take up a third of the carbon emitted by human activity — roughly two billion metric tons each year. The amount of carbon that would double the load in the atmosphere would increase the concentration in the deep ocean by only two percent.

There are questions about whether some schemes for ocean carbon sequestration, like fertilizing plankton blooms, would be safe or effective. To find out, scientists from Berkeley Lab are testing new kinds of robotic SOLO floats, originally developed at the Scripps Institution of Oceanography to test temperature and salinity. Berkeley Lab versions are equipped to measure organic and inorganic carbon particulate matter, from the surface to more than a kilometer's depth.

More on the Lab's research on carbon management is at www-esd.lbl.gov/CLIMATE/index.html

A 100-Year Scientific Legacy

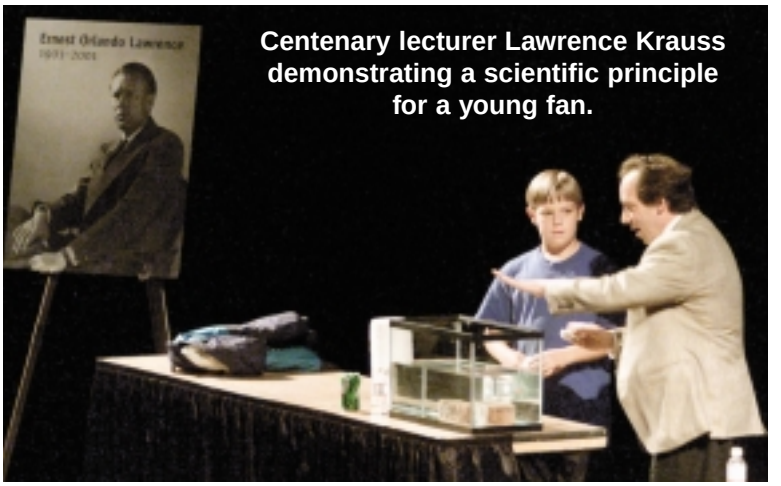
August 8 marked the 100th anniversary of the birth of Ernest O. Lawrence, Berkeley Lab's founder and the inventor of the cyclotron—an ingenious little gadget that enabled scientific investigation to reach into the atom's nucleus, heralding a new era in physics and earning him a Nobel Prize.

"Lawrence was the spark that turned the University of California into a world leader in science," said Lab Director Charles Shank.

One of Ernest Lawrence's greatest legacies is as the man who pioneered team science, an approach that brings together researchers from many areas of expertise to work on a common problem. His laboratory has become a center for interdisciplinary studies among engineers, chemists, physicists and life scientists that continues to this day.

In honor of Ernest Lawrence's Centenary, astrophysicist and author Lawrence Krauss delivered a public lecture in Zellerbach Hall, entitled "An Atom from Berkeley: A Cosmic Mystery Story."

For more on the Lawrence Centenary, go to enews.lbl.gov/10-1-01.html.



Centenary lecturer Lawrence Krauss demonstrating a scientific principle for a young fan.

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Science on the Hill is produced by the Berkeley Lab Public Affairs Office.
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Berkeley Lab is managed by the University of California for the U.S. Department of Energy.

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